MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

DOS5311 – OPERATING SYSTEMS

(DIT)

21 OCTOBER 2019
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **4** pages (excluding cover page).
2. Answer **ALL** questions.
3. Write your answers in the answer booklet provided.

Structured Questions, 4 Questions (Total: 40 Marks)
Instruction: *Answer ALL the questions in the Answer Booklet provided.*

QUESTION 1

a) Explain **real-time systems**. Provide **TWO (2)** examples of current applications of real-time systems. (2 Marks)

b) Given the memory layout as shown in **Figure 1**, determine the address of base registers and limit registers for Process X and Process Y. (2 Marks)

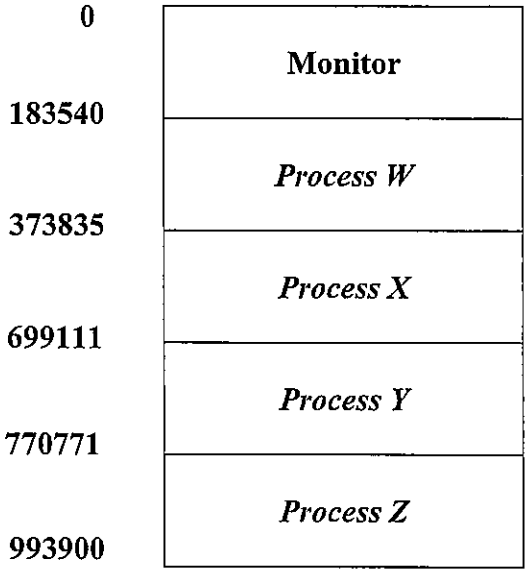


Figure 1

c) What is **microkernel** operating system? State the main function of microkernel. (2 Marks)

d) Briefly explain **process control block (PCB)**. (2 Marks)

e) State **FOUR (4)** types of access that can be controlled by file owner in file protection. (2 Marks)

[TOTAL: 10 Marks]

Continued...

QUESTION 2

Consider the following set of processes in **Table 1** with the length of the CPU-burst time given in milliseconds. The processes arrived according the arrival time.

Process	Arrival Time *(ms)*	Burst Time *(ms)*	Priority
P_1	3	6	5
P_2	6	6	1
P_3	3	9	1
P_4	0	3	2
P_5	9	8	2

Table 1

Draw Gantt Charts illustrating the execution of these processes using the following scheduling algorithms. Calculate the ***waiting time*** for each process and the ***average waiting time*** for the scheduling algorithms.

i. First-Come-First-Served (FCFS). (4 Marks)

ii. Preemptive Shortest-Job-First. (6 Marks)

[TOTAL: 10 Marks]

QUESTION 3

Consider a system with five processes P_1, P_2, P_3, P_4 and P_5 and three resource types:

Resource X (14 instances), Resource Y (12 instances), Resource Z (8 instances).

	Resource X		Resource Y		Resource Z	
	Max	**Allocation**	**Max**	**Allocation**	**Max**	**Allocation**
P_1	7	1	5	2	5	3
P_2	6	3	5	1	7	0
P_3	6	3	6	3	2	0
P_4	3	1	3	0	2	1
P_5	4	1	3	2	5	0

Matrix 1

Continued...

Available		
Resource X	**Resource Y**	**Resource Z**
5	4	4

Matrix 2

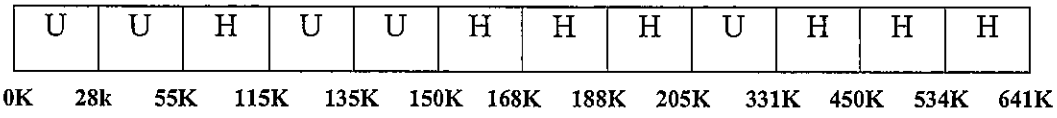
a) Based on current allocations and available resources given in **Matrix 1** and **Matrix 2**, determine the content of ***Need*** matrix. (1 Mark)

b) Complete the following:
   i. If P_2 requests for additional instances (1, 1, 0), by using Resource Request Algorithm, can this request be granted? (1 Mark)
   ii. Identify the contents of Allocation, Need and Available matrices. (1.5 Marks)
   iii. Determine whether deadlock can be avoided by executing Safety Algorithm. Justify your answer. (6.5 Marks)

[TOTAL: 10 Marks]

QUESTION 4

a) Given a heap of memory management scheme with the following free list:



* U - Used
* H - Hole

The following process request will be received in order as listed in **Table 2**:

Process Number	Size in Kilobytes
P1	30
P2	15
P3	88
P4	45
P5	10

Table 2

Draw the memory allocation for each request above using the following memory allocation schemes:

i. Best Fit (BF) (2 Marks)

ii. First Fit (FF) (2 Marks)

Continued...

b) Consider the following page reference string:

d, o, s, d, a, b, s, o, c, s, a, d

Assuming a paging scheme with **FOUR (4)** empty frames, trace the allocation of pages to frames using the following page replacement algorithms:

i. Least Recently Used (LRU). (3 Marks)

ii. First-In-First-Out (FIFO). (3 Marks)

[TOTAL: 10 Marks]

End of Page.